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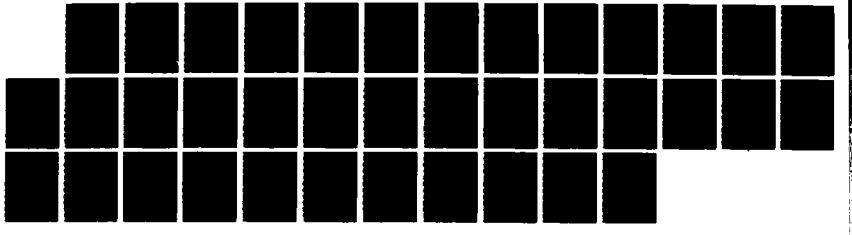

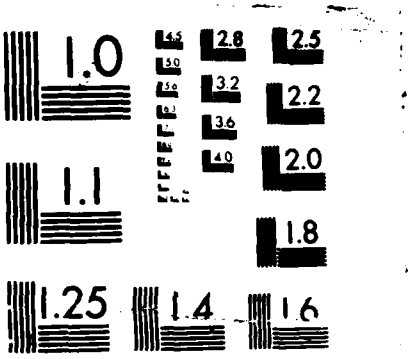

BRMC-85-5164-1

MODERN TECHNOLOGIES TECHNICAL REPORT 8003-03

DECISION RULES FOR ENHANCED BREAKOUT

FINAL REPORT

Prepared for
Air Force Business Research
Management Center

Under Contract Number
F33615-85-C-5164

Prepared by

MODERN TECHNOLOGIES CORPORATION

20 March 1987

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This report presents a recommended model to support the AFLC Competition Advocate personnel in the evaluation of candidate items for breakout or competition. The model recommended includes five major elements: 1) Estimated savings over the expected remaining service life; 2) Non-recurring costs for breakout to direct purchases; 3) Recurring costs for breakout to direct purchase; 4) Non-recurring costs for breakout to competition and 5) Recurring costs for breakout to competition. The model describes the composition of each of these elements, the sources for the necessary data and provides, where possible, interim estimates to be used until detailed historical data can be developed.

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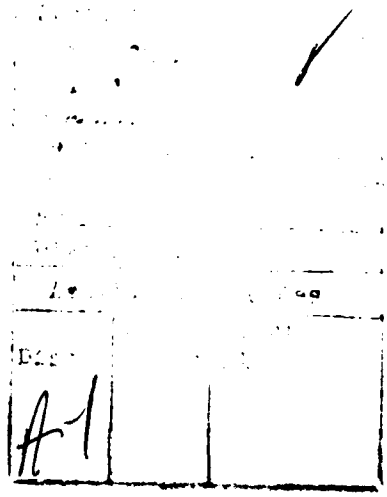


1 INTRODUCTION AND SUMMARY

This technical report describes the Phase II activity accomplished by Modern Technologies Corporation under contract F33615-85-C-5164. This Phase II effort, under the sponsorship of the Air Force Business Research Management Center, was accomplished to recommend an interim model to support AFLC Competition Advocate (AFLC/CR) personnel in the economic evaluation of breakout candidate items.

This effort is based on the results of the on-site research accomplished in Phase I supplemented by a review of a broad cross section of other documentation related to breakout and economic evaluation. The model recommended includes five major elements:

1. Estimated savings over the expected remaining service life.
2. Non recurring costs for breakout to direct purchase.
3. Recurring costs for breakout to direct purchase.
4. Non recurring costs for breakout to competition.
5. Recurring costs for breakout to competition.

The model describes the composition of each of these elements, sources for the necessary data and provides where possible, interim estimates, to be used until detailed historical data can be developed.

2 PROBLEM STATEMENT

There has been, and will continue to be, exerted strong pressure to increase the number of dollars and number of contract actions awarded under full and open competition within AFLC. There have been significant savings realized by AFLC as a direct result of introducing competition to the spare parts acquisition process and from purchasing spare parts directly from the manufacturer. The magnitude of these savings was described in MTC's Phase I Technical Report under this contract. It was observed during the Phase I research that not all breakout actions yielded savings and that there was a distribution of savings attained. In addition, it was observed that the cost of accomplishing the breakout for specific items could not be determined by reviewing historical data at the ALC's.

Given the distribution of potential savings, it would be beneficial to the AFLC to focus resources on those items which offer the greatest potential return in reduced cost. Resources should also be focused on those breakout actions which can be accomplished at minimum cost. The primary focus of this research is on the latter issue. Specifically, how can AFLC model the breakout process, identify resource consumption at each of the processing stations and use this information to develop a priori estimates of the cost to break-out specific spare parts. In addition, some recommendations were to be developed concerning the evaluation of savings attained.

A fundamental element of the problem lies in the unpredictable nature and magnitude of the savings and costs involved with competition initiatives on a specific part. Accurately predicting these savings and costs depends on developing historical relationships between these elements and descriptors of the specific parts. This activity is, in turn, dependent on the existence of a data base of costs which can be analyzed to yield these relationships. The current management and ADP systems within AFLC are not structured to provide this type of data. In addition, the potential composition of the costs elements involved with the competition initiatives is not well understood. MTC's Phase I efforts provided macro level estimates of these costs, but these are insufficient to serve as a basis for the

evaluation of individual parts. The purposes of this Phase II report is to provide a recommended model for the cost streams involved with the competition initiatives, describe sources for this data and, where possible, provide estimates which can be used until specific cost data can be gathered and analyzed.

3 RESEARCH APPROACH

The results provided in this Phase II report draw heavily upon the data obtained during the on-site Phase I effort. In addition, a broad search of existing documentation on the breakout process and estimating approaches was accomplished. This research included review of Public Laws, Federal Acquisition Regulation (FAR) and Federal Acquisition Circulars (FAC), the supporting Defense Federal Acquisition Regulation Supplement (DFARS) and the AF Acquisition Circulars (AFAC). The research also included review of the Office of Management and Budget Circular A-76, Performance of Commercial Activities and its supporting implementing directives. Applicable AF and AFLC Regulations and Pamphlets were also reviewed to obtain information on costs and their estimated magnitudes.

The information gathered was evaluated to determine a reasonable structure for the costs elements and the preliminary model construct developed. This model was then refined and is presented in Section 5 of this technical report.

4 MODEL EVALUATION

There are two existing models which are used within the government for evaluation of breakout type situations. The first is the model prescribed in AFR 57-7 which governs the breakout process within AFLC. The second model is a more general model prescribed by Office of Management and Budget Circular A-76, Performance of Commercial Activities. Each of the models is briefly described below.

4.1 AFR 57-7 Model

The fundamental model which has been prescribed for use in the evaluation of breakout is contained in Attachment 3 to AF Regulation 57-7. Under this model, several types of costs must be estimated, summarized, and compared to estimated savings to properly determine the economics of breakout. These costs include:

(1) Direct Costs. Direct costs of breakout normally include all expenditures that are directly and wholly identifiable to a specific breakout action, but are not reflected in the part's unit price. Examples of direct costs cited in AFR 57-7 include additional special tooling or special test equipment, qualification testing, quality control expenses, and configuration control if borne by the government. The steps prescribed in this model which relate to estimating breakout costs include:

(a) Step 35. Estimate the government's cost to acquire and furnish tooling or special test equipment.

(b) Step 36. Estimate the government's cost of qualifying the new source.

(c) Step 37. Estimate the government's cost, if any, for assuring quality control, including contracting for quality control.

(d) Step 38. Estimate the government's cost to purchase rights in data.

(e) Step 39. Estimate the cost of maintaining configuration control.

(2) Performance Specification Costs (Step 41). If the breakout candidate is to be constructed to a performance specification, the performance specification breakout cost elements listed below need to be estimated. The addition of a number of nonstocked parts which must be stocked by the supply system for repairs can be a significant element of cost associated with the decision to compete a performance specification assembly. (The same situation does not arise with respect to a design specification assembly, since virtually all spare parts used to repair such an assembly are exact copies of parts already in the assembly.) The cost of introducing these nonstocked parts into the system includes:

(a) Additional Catalog Costs. The number of nonstocked parts forecasted to be in the competed assembly, multiplied by the variable cost of cataloging per line item.

(b) Additional Bin Opening Costs. The number of nonstocked parts forecasted to be in the competed assembly, multiplied by the variable cost of a bin opening at each of the locations where the part is to be stocked.

(c) Additional Management Costs. The number of nonstocked parts forecasted to be in the competed assembly, multiplied by the variable cost of management per line item.

(d) Additional Technical Data Costs. The cost of a new set of technical data for the competed assembly, including the variable expenses of its production, reproduction, and distribution.

(e) Additional Repair tools and Test Equipment Costs. The cost of additional special tools and test equipment not otherwise required by the existing assembly.

In some cases, it may be necessary to convert an existing performance specification to a design specification. In these cases, additional cost can be incurred.

The decision to change a performance specification part to a design specification part requires a critical engineering examination of the part itself, as well as a review of the impact such a change might have on the operational effectiveness of the system in which the equipment is to be used. Procurement of a performance specification part by a subsequently acquired design specification subjects the

government to the additional hazard of losing the money paid for developing the design specification, should the design alter during the procurement leadtime period. Accordingly, the engineering evaluation should closely review design stability over the anticipated procurement leadtime to avoid procuring an obsolete or nonstandard part if the decision is made to compete it.

(5) Step 47. If the estimated costs to obtain a design specification combined with the breakout costs estimates above are less than the estimated savings, initiate action to obtain a design specification package. The part is given an interim acquisition method code for a period until it can be rescreened using the design specification package.

This set of costs served as a basis for the development of the cost model described in Section 5 of this Report. The primary difficulties with using the AFR 57-7 model as written are the lack of specific cost data and its failure to consider the full set of cost elements. In addition, this model does not include the cost of the government activity in accomplishing the breakout activity and in managing the subsequent competitive (or direct purchase) acquisition activity. The model described in Section 5 is based on a providing a more indepth description of the involved cost elements.

4.2 OMB Circular A-76 Model

Recent changes to the Component Breakout coverage in the FAR have expressed a preference for using the cost evaluation approach of Office of Management and Budget Circular A-76, Performance of Commercial Activities, as a basis for economic evaluation. The basic concept in the OMB A-76 approach is to identify the functions in the form of a Performance Work Statement, break the functions into discrete elements and develop estimates for the direct labor, direct material and overhead associated with the activity. The direct labor estimates depends on a clear definition of the performance work statement. This performance work statement describes the specific tasks to be accomplished. From these tasks and historical data, the personnel resources are quantified.

This model specifically focuses on developing a fully burdened estimate of the government labor costs involved with the activity being evaluated. This fully burdened cost includes consideration of leave time (vacation, sick and holiday), fringe benefits and government overhead. Since the competition initiatives usually involve expenditure of AF labor resources, the model in Section 5 will include consideration of fully burdening these labor costs.

5 RECOMMENDED MODEL

As described in the Phase I report, the costs associated with the competition initiatives result from three sets of activities:

1. the cost associated with the direct purchase of items previously bought from the prime contractor
2. the costs of competing items previously bought sole source and
3. the additional costs of processing those items which must still be bought on a sole source basis.

These costs are offset against the savings obtained from lower purchase price resulting from the breakout or competition.

The Phase II effort is focused on the development of a model which can serve as a basis for quantifying these costs. This focus results from a desire to identify, a-priori, specific candidates for breakout or competition which will yield the largest net savings to the Air Force. A primary determinant of the net savings is the expected reduction in cost from the introduction of competition or breakout. AFLC has developed and improved their techniques for a measuring savings on a broad basis. It should be noted, however, that little effort is being expended on developing an understanding of the causes of variability in the attained savings.

The objective of this Phase II effort is to recommend an interim model to assist AFLC/CR in complying with the intent of AFR 57-7 on the economic evaluation of potential breakout or competition candidates.

5.1 Model Introduction

In accomplishing the breakout or competition of a specific part or assembly, there are five categories which are of significance in the economic evaluation:

1. Estimated savings over the expected remaining service life.
2. Government non recurring costs for breakout to direct purchase
3. Government recurring costs for breakout to direct purchase

4. Government non recurring costs for breakout to direct purchase and

5. Government recurring costs for competition.

It is necessary to segment the costs in this manner to support the AFLC/CR decisionmaking process. For each sole source part which may be evaluated these are three potential decisions.

1. Continue to purchase on a sole source basis

2. Break part out for purchase from the actual manufacturer or

3. Competitively purchase the part.

The current acquisition policy environment strongly favors the competitive purchase decision. The economic evaluation in this environment has two purposes:

1. determine the priority for application of the limited resources available for breakout or competition or

2. justify, on economic grounds, a decision to continue with a sole source acquisition approach.

The second purpose is most often applicable to low dollar parts where the savings, expressed as a percentage of acquisition cost, would be extremely low. In this case, the net savings to the AF could be negative and the effort to compete or breakout the item viewed as a waste of funds. The first purpose, prioritizing resources, is a more pressing issue. The AFLC buy program continue to generate the need for decisions concerning the acquisition method for an extremely large number of parts. Attempting to aggressively pursue all these potential opportunities carries with it the risk of delay in acquiring needed parts with consequent negative impact on readiness and sustainability. As such, the breakout manager needs to have a rational basis for applying resources. As data becomes available which reflects the elements of the proposed cost model, the managers will be able to make more informed decisions on resource application.

5.2 Model Structure

The model can be structured in the following general form:

$$S = PXT - U - V - W - YT - ZT$$

where S = Net savings expected

P = Expected percentage reduction in cost

X = Remaining program buy value at current price ($)

T = Remaining program life of the past (years)

U = Nonrecurring cost for breakout ($)

V = Costs associated with competing based on a performance specification ($)

W = Nonrecurring cost for competition ($)

Y = Recurring cost for breakout ($)

Z = Recurring cost for competition ($)

In this general structure, some decision rules could be structured of the form:

(1) If $S > 0$ then compete item

(2) If $S < 0$ and $PXT > (U+Yt)$ then breakout

(3) If $PXT < (U+Yt)$ continue sole source

To develop the necessary estimates of the cost and savings requires that existing historical data be of the form that can be used to support these estimates. For each of the major cost elements, there is a set of contributing costs. The nonrecurring costs for breakout, W, is primarily comprised of the screening process which determines the feasibility of breakout. This screening activity is also applicable to the competition of previously sole source items.

Screening is the review of individual items to determine the appropriate Acquisition Method Code for the specific item. The Acquisition Method Codes are shown in Figure 5-1.

AMC	Description
1.	Suitable for competitive acquisition
2.	Suitable for competitive acquisition for the first time.
3.	Acquire directly from the actual manufacturer
4.	Acquire directly, for the first time, from the actual manufacturer.
5.	Acquire only from prime contractor although the engineering data identifies the Federal Supply Code for manufacturers (FSCM) and part

number of a source other than the prime contractor.

Figure 5-1 AMC Codes

The screening process involves a large number of steps involving a number of specific organizations. The process essentially involves five phases:

1) data collection
2) data evaluation
3) data completion
4) technical evaluation
5) economic evaluation and
6) supply feed back

The process is accomplished through the use of an AFLC/AFSC Form 761. The processing sequence for the Form 761 is shown is the flow chart in figure 5-2. Processing is initiated by the inventory manager (IM). The document is then reviewed by the responsible equipment specialist in the IM division to assess the accuracy of the data on the Form 761 and add the identity of other known sources. After IM division review, the form is forwarded to the Competition Advocacy (CR) function.

Primary responsibility for CR review is assigned to the Engineering Division (CRE). CRE orders data from MMED (data repository), provides internal control of documentation and reviews and evaluates the technical data to assess its adequacy to support the AMC and Acquisition Method Suffix Code (AMSC) review/assignment efforts. (The AMSC provides codes for the reasons which support assignment of the specific AMC). CRE also determines additional data requirements and sponsors, where necessary, data acquisition. After review, CRE develops the Engineering/Technical Data packages, including all background and supporting data necessary to accomplish AMC/AMSC assignment. Where limited rights engineering data exists, CRE sponsors acquisition of the rights through the implementing command and acts, with Judge Advocate (JA), MM, and PM, to challenge limited rights claims. Copies of data rights challenges and final determinations are provided to the MMED Engineering Data Services Center for their official files. Where problem exist with the data

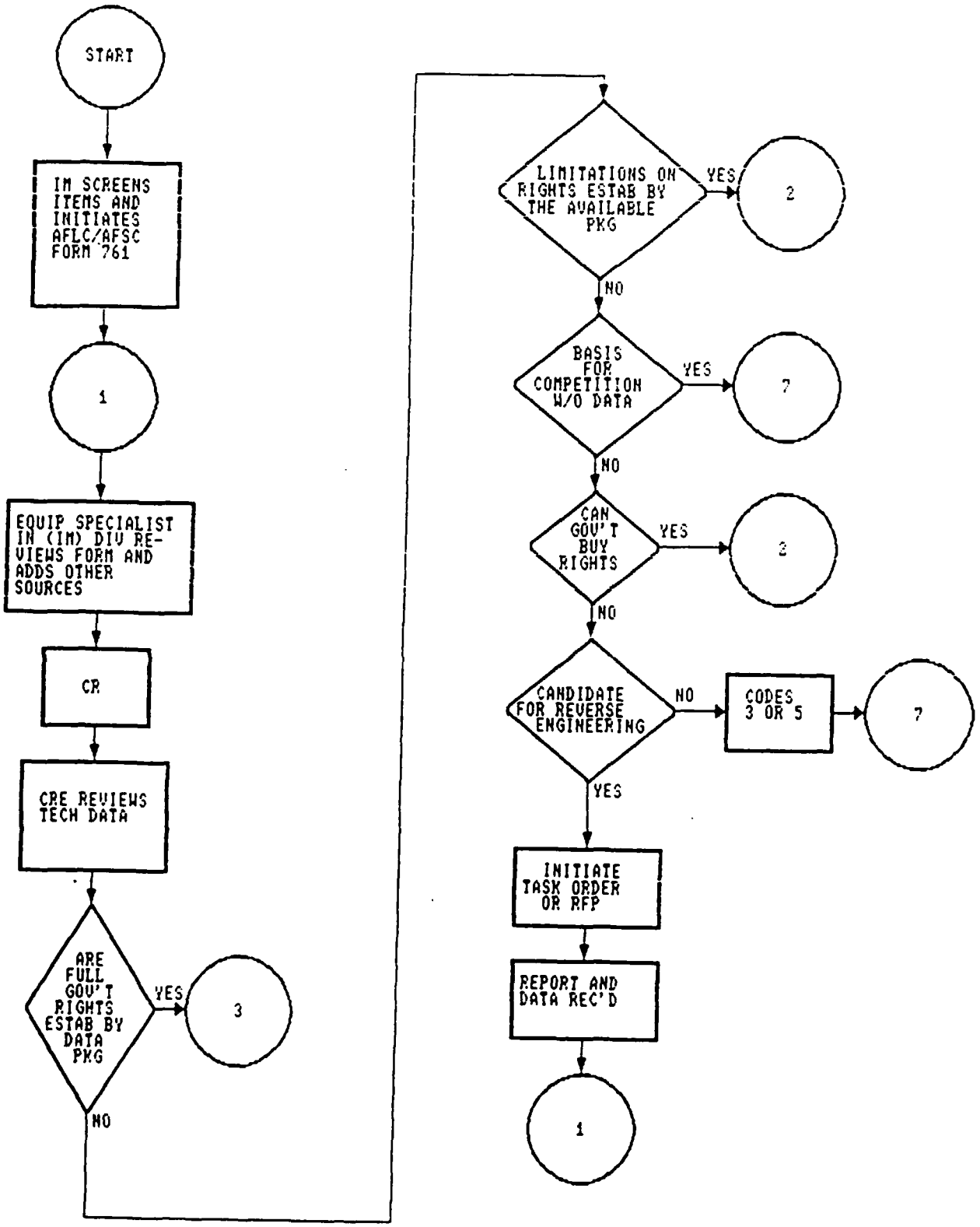
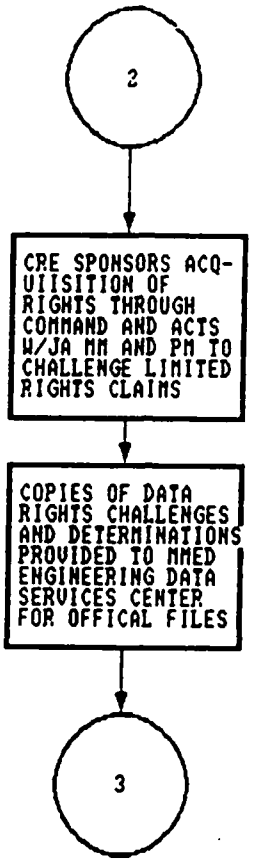


Figure 5-2 Screening Process



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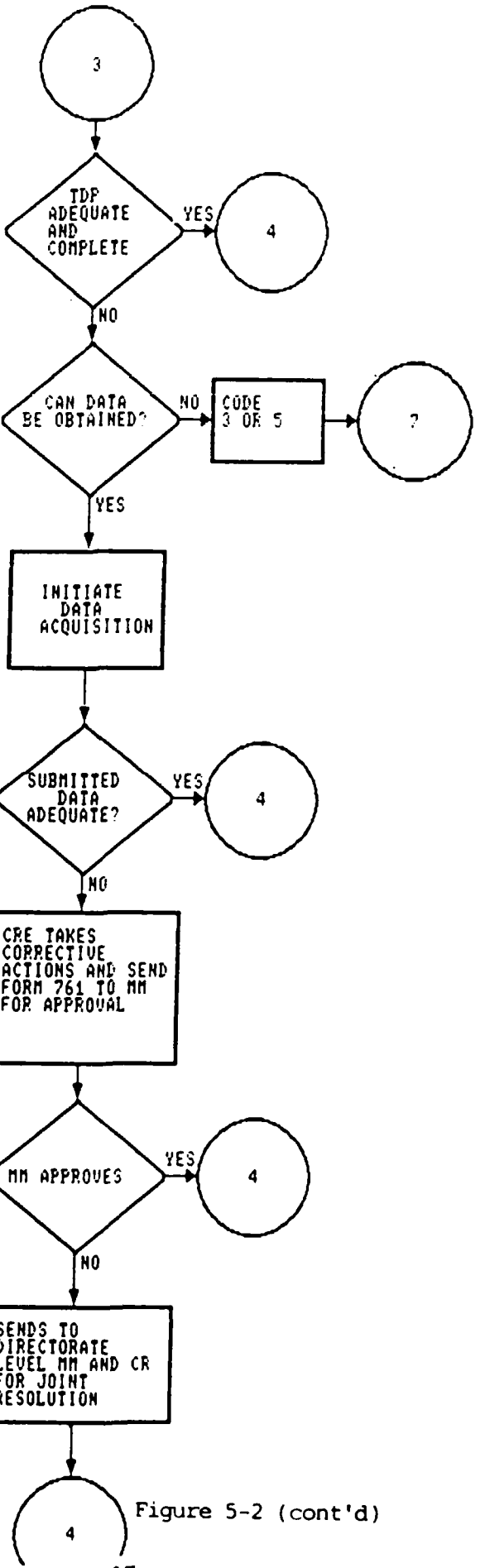

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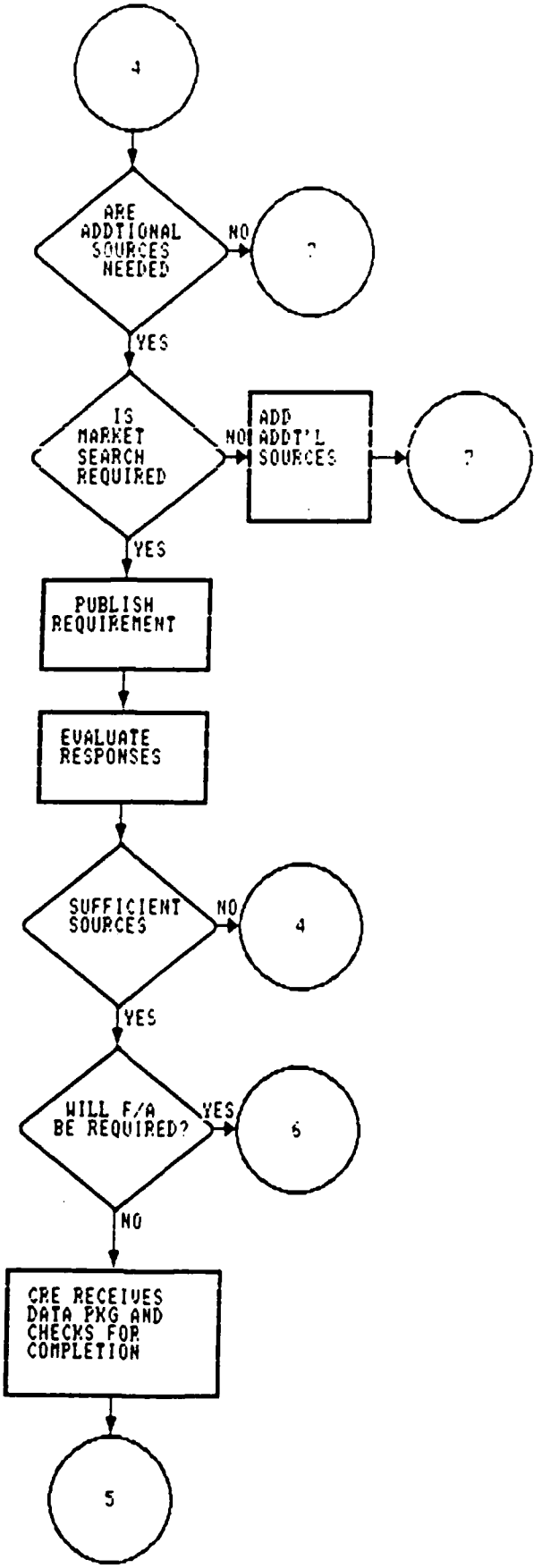

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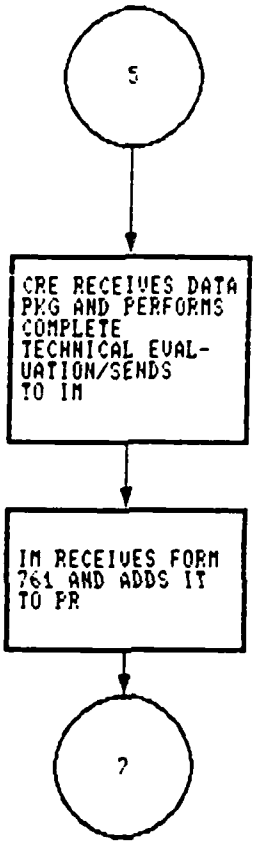

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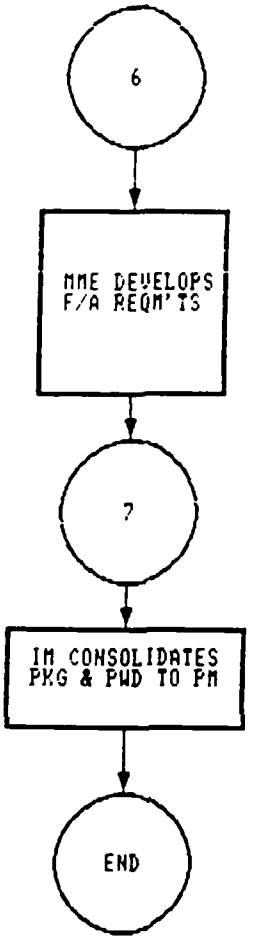


Figure 5-2 (cont'd)

package, CRE may recommend item, material, and manufacturing process substitutions and solicit appropriate engineering review and approval relative to factors such as safety and item critically which may affect competition decisions. If necessary, CRE identifies candidates and conducts reverse engineering after verifying cost effectiveness and obtaining approvals required by acquisition regulations. CRE screens breakout candidates for data adequacy, completeness, and limited rights status relative to competition. Where questionable legends exist, CRE accomplishes the necessary research and prepares all pertinent background information and determines and pursues appropriate courses of action.

Based on engineering and technical evaluations of all available data, CRE assigns an AMC/AMSC, and documents the decision on the AFLC Form 761, Screening Analysis Worksheet, or AFLC/AFSC From 1, Advance Acquisition Data Support Worksheet. CRE obtains technical approval from the MM technical approval authority in accordance with local MM and CR procedures. When the MM engineering authority does not approve the AMC/AMSC assigned by CR, the supporting documentation for the disapproval must satisfy the sole source justification requirements set up by AF acquisition directives. AMC/AMSC issues which cannot be resolved at the division level are elevated to the MM and CR Directorate level for resolution. After completion of the CRE screening activity, and receipt of the necessary MM engineering concurrences, the Form 761 is returned to the IM for inclusion with the Purchase Request (PR).

Currently there is no personnel accounting system which captures separately the elements of cost in the screening process. The additive costs necessary to accomplish the screening for a breakout action is minimimal since the primary activity is to identify the actual manufacturer (often shown on the drawings) or to query the prime contractor for the identification. In today's environment, most prime contractor's are willing to provide this information.

There is little specific information on the detailed costs of screening and individual reviews often have significant variation in the level of effort required. An effective resource application model should be based on more indepth understanding of the specific costs. Consequently, it is recommended that a form such as that shown in figure 5-3 be utilized in conjunction with the 761 screening process. This form would allow the collection of detailed cost data. The data could be stored in Personal Computer (PC) based records that would allow for analysis. In addition to providing support for the breakout model, this data would be of value to the ALC's in workload and personnel planning.

The second set of costs considered are the recurring costs for purchasing directly from the manufacturer. These costs involve the additional PR preparation costs and the costs associated with processing the contractual action. There is also cost incurred in the administration of the contract. Many of the PR preparation and contracting costs can be minimized through consolidation. In most cases, the actual manufacturer for a specific part will also be the manufacturer for similar parts on the same or other weapon systems. As such, the probability is high that there are other buys to support the consolidation effort.

The non-recurring costs to support a competitive buy are more likely to represent a substantial investment of AF resources. These costs are primarily incurred during the screening process and the form shown in figure 5-3 can be used to record these costs. This form can also provide a better estimate of the Cost to Order for calculations required by DOD Instruction 4140.39 Procurement Cycles and Safety Levels of Supply for Secondary Items.

5.3 Detailed Model Description

In the expanded form the recommended model can be expressed as:

$$S = PXT - U - n\sum_{i=1}^{4} V_i - \sum_{j=1}^{6} W_j - t\sum_{k=1}^{2} Y_k - t\sum_{l=1}^{8} Z_l$$

where P,X,T and U are as defined in paragraph 5.2.

n = number of nonstandard parts resulting from performance specification

PROCESS SHEET FOR 761 REVIEW

NSN: NOUN:

CURRENT AMC: RESULTING AMC:

CURRENT SOURCE: EST ABV:

	Date Init	Date Compl	Hours	$	Additional Reviews
Equip Spec Rev					
Data Rights Eval					
Data Acquis					
Data Pkg Review					
Data Acquisition					
Package Completion					
Reverse Engineering					
Rights Challenge-CRE					
Rights Challenge-JA					
Rights Challenge-PM					
Source Identification					
Source Development					
F/A Determination					
F/A Reqm'ts					
Package Assembly					

Figure 5-3 Process Sheet

v_1 = item entry for nonstandard part
v_2 = management of non standard part
v_3 = technical data for non standard part
v_4 = repair tools and test equip for non standard part
w_1 = data package review and verification
w_2 = data rights purchase
w_3 = data package purchase
w_4 = first article test and inspection
w_5 = qualification test billed to government
w_6 = reverse engineering
y_1 = PR preparation
y_2 = contract award
z_1 = special tooling transhipment
z_2 = source approval
z_3 = source development
z_4 = solicitation sets
z_5 = additional bid evaluation
z_6 = pre award surveys
z_7 = technical assistance
z_8 = contract administration

5.4 Variable Description and Data Sources

5.4.1 Design Specification Costs

The following set of costs, V_i, apply only if it is determined to purchase the item competitively using a performance specification and some of the component parts of the item will be entered into the AFLC supply system.

Item Entry for Non standard Parts (v_1) The item entry cost can be defined as the cost to initially catalog, stock, store and issue an item for the Directorate of Material Management, Comptroller, and the Cataloging and Standardization Center. Per AFLCP 173-10, the entry costs can be estimated, in FY 85 dollars, as:

EOQ Items	$ 636.20
Recoverable Item	1299.53
Equipment Item	1444.80

Management of Non Standard Part (v_2) This element is defined as the cost to manage the cataloged record of the item for a period of one year. AFLCP 173-10 indicates that this cost can be estimated as $213.45 (FY 85).

Technical Data for Non standard Part (v_3) Included in this category is the data required to support the nonstandard parts. This data could include engineering drawings, specifications, standards and item descriptions. AFLCP 173-10 indicates that a cost of $662.32 (FY 85) per page can be used to estimate technical data costs.

Repair Tools and Test Equipment (v_4) These costs represent the expenditure for tools and test equipment if any of the non-standard items are reparables. This cost would be estimated (perhaps using the CRV price analysis group) for each item considered.

5.4.2 Nonrecurring Costs for Competitive Purchase

Data Package Review and Verification (w_1) These are the costs involved in reviewing the Technical Data Package (TDP) for completeness and accuracy to support competitive purchase. Costs for this activity would be gathered through 761 Process Sheet. Until sufficient data is gathered to support estimating, the Phase I estimate of 11.5 hours in CRE and 2.5 hours in MM hours may be used.

Data package verification is the process of gathering the technical and engineering data and confirming its completeness and adequacy for use. In some cases, the effort may also include adding specific elements of data which may be missing. The majority of the effort involved with this task is imbedded in the AFLC/AFSC Form 761 processing effort, but additional effort is expended as part of the PR review process to confirm that the data package being provided with the PR for competitive purchase is complete and adequate. Estimates received from MM and CR personnel indicate that this additional effort amounts to about 1.5 hours per competitive solicitation.

Data Rights Purchase (w_2) This is the cost to purchase the rights to needed data by AFLC. The cost of data purchased by AFSC is not material to the breakout decision since the cost was incurred (or

not incurred) in the past. Since CRE is responsible for sponsoring the acquisition of missing data, these action should be logged and the price paid, if any, should be recorded. This cost should have a distribution in which a significant proportion of the data rights will be received at no cost. No current estimate for this cost has been obtained.

Data Package Purchase (w_3) This is the cost involved with ALFC acquiring the physical data package. As with W_2 above, in many cases this additional data will be provided at no cost to the AF. Since these purchases are normally handled through CRE, recording the cost and the general description of the package acquired (in terms of number of drawings, specifications, etc.) would provide a valid data base for estimating these costs. Until a cost data base is developed, the estimated cost currently suggested in AFLCP 173-10 of $662.32 per page.

First Article Test and Inspection (w_4) These costs are incurred at two points in the acquisition process. The first is during the review cycle to determine if first article will be required and, if so, whether it will be government test or contractor test. This decision process should be relatively consistent and a standard cost in hours, with the associated labor grade, should be relatively straightforward for MM to estimate. The second element of cost is involved with the actions taken at the ALC after receipt of the first article. First articles are used as a vehicle by which a contractor demonstrates the capability to manufacture a specific item. Under a First Article contract, the contractor may start production only after a sample, or First Article, has been produced and tested. Typically, the First Article process requires one year to complete. The First Articles are produced and, in most cases, delivered to the ALC for inspection and test. The items tested can be characterized as acceptable, requiring rework or unacceptable. They may also be accepted on the condition that production units contain specified changes or modifications to the configuration of the First Article. Many of the First Articles submitted require destructive testing.

There is a generally held belief among a large majority of the persons interviewed during the course of this research that the number of First Articles should be increasing substantially. A major problem encountered in estimating the cost of First Articles is that there is no central source where First Article contracts are tracked. Some data was available at individual ALC's indicating that the volume was increasing. The increase in First Article contracts has two separate cost impacts. The first impact relates to the cost to physically process the First Articles at the ALC's. The time required to process a First Article is estimated to be 20 hours of administrative processing and 25 hours of test and inspection.

The second impact results from the costs associated with the additional lead time for First Articles. Typically, a First Article will be delivered within 6 to 12 months after award. In addition to this time, allowance must also be made for the time needed for evaluation and testing of the First Article. After approval of the First Article, the normal production lead time would be incurred. We were unable to assess the dollar cost associated with this increase in the lead time. It is recommended that MM establish a central point for reporting of First Article activity that would include the level of activity as well as the costs incurred for test and evaluation in both MM and MA.

Qualification Test (w_5)

A qualification test is a requirement for testing or other quality assurance demonstration that must be completed by an offeror before the offeror is awarded a contract. Where such requirement are imposed, the government must develop an estimate of the cost of the testing and evaluation. In addition, the necessity for the qualification prior to award must be justified in writing. Potential offerors must, according to AF Acquisition Circular 85-28, be provided the opportunity to demonstrate their ability to meet the qualification requirement.. This qualification will be at the offeror's cost except for small businesses which successfully qualify and could reasonably be expected to compete for the requirement and where the expected savings from the competition involving that small business are likely to result in cost savings the government may bear the cost. The CRS

function should monitor the qualification process as part of their source development charter and government (and offeror) costs should be recorded along with information concerning the item involved. This data base could then be used to develop the estimates of qualification cost required by AFAC 85-28 as well as supporting the development of cost evaluation of breakout candidates.

Reverse Engineering (w_6) Reverse engineering (RE) as practiced in AFLC can range from simple substitution of government/industry specifications for missing contractor specifications or when the government lacks rights for use of the contractor specifications to development of a major portion of the engineering documentation needed to produce the item. In order to distinguish between simple RE and the more complex activities, RE has been categorized into two levels based on the complexity of the task.

Level I reverse engineering includes those efforts accomplished to complete an acquisition data package by substituting government or industry specifications or by adding engineering notes when some of the drawings are illegible, missing or where the government does not have rights to some portion of the technical information. It can also include redrafting effort to improve illegible drawings. Normally Level I can be accomplished by review of available data and use of general engineering knowledge. Physical measuring and analysis of the part is not necessary.

Level II reverse engineering requires physical examination, measuring and analysis of existing parts to produce a complete acquisition data package with full government rights thereto. Analysis of the parts use may also be necessary. The effort includes determination if a sample is satisfactory for RE purposes and preparation of inspection and acceptance criteria.

There is an active RE program at each of the ALC's. As such, a data base of RE costs should be available. For optimum utility, these costs should be described in terms of some known measure (perhaps estimated unit cost) so that estimates of the cost for RE can be developed during the economic evaluation process.

5.4.3 Recurring Costs for Breakout

PR Preparation (y_1). Additional cost for PR preparation results from the need to process a larger number of PR's for a similar quantity of buy items. This increase is due to MM inability to place large numbers of Line Items on a single PR which would be processed sole source to a major prime contractor. These line items fall into two classes. The first class includes those items identified for direct purchase. There is some capability for consolidation on this class of PR since line items for individual suppliers can be placed on a single PR. The second class includes those line items which are to be obtained competitively. The only consolidation capability in this class is consolidating line items which include parts from the same part family. In this context, part family means a collection of parts which are constructed of similar materials using the same types of manufacturing processes. Consolidation beyond this point is difficult. The expected result of these two factors is a decrease in the average number of line items per PR. During the Phase I research effort, no evidence could be found to support the expectation of decreased Line Items per PR. For evaluation purposes, an estimate of 1.5 hours could be used, on the assumption that a competitive buy will require a separate PR.

There is also additional effort to prepare purchase descriptions for each line item. The Defense Procurement Reform Act of 1984, PL 98-525 established a requirement to provide an expanded purchase description to support synopsis in the Commerce Business Daily and competitive purchasing. Based on interviews with Material Management personnel, this requirement has added approximately 1 hour of processing effort for each PR.

Contract Processing (y_2). There were a number of assertions during the Phase I research that the workload within the contracting function had increased. Perhaps one of the most serious impacts on the contracting function is that which results from the cumulative impact of changes in the contracting process and the continuity of the change activity. Accomplishing the large volume of required contracting actions depends to a certain degree on being able to establish a processing routine. The continuing change in the rules

and procedures affecting the contracting function have had serious negative impacts on the productivity of the contracting workforce.

The time required to physically process a buy package was alleged to have increased substantially. This increase was due to the need to exercise greater care in the evaluation of potential sources and in the evaluation of prices to determine that they were fair and reasonable prior to award. The impact of this increased workload was extremely difficult to assess since no record of hours expended on each buy action is maintained. The impact can be inferred from the changes in the number of PR's processed per person with in the AFLC Central contracting function. In FY 85, the Central contracting function was able to process an average of 96 PR's per person or approximately 18 hours per PR. If this ratio had held through FY85, the Command would have required 2000 persons to process the approximately 192,000 PR's. Actual personnel on board during FY 85 was 2778 and even with this increase, the average flow time for buy actions was 113 days as compared with 74 days in FY 83. For estimating purposes, we can assume that the per PR effort has increased by as factor of 1.4 yielding an estimated time per PR of 25 hours.

5.4.4 Recurring Costs for Competition

Special Tooling Transshipment (z_1) This cost will be incurred only for those items for which special tooling is required and where that tooling is to be provided to a new source. This can be estimated by having DS provide an estimated cost for a typical shipment size of 400 pounds, a volume of 5 cubic feet over a distance of 1000 miles.

Source Approval and Source Development (z_2 and z_3) There are two situations which require review of potential sources. The first, source approval, generally is considered to include review of documentation submitted by a potential source independent of any specific request by the AF. The second, source development, generally includes actions taken by the AF to validate the capability of a second source for a noncompetitive item or a single source for an item

which has no known sources. These activities and their related resource requirements are discussed below.

Source approval actions are taken to determine the capability of a contractor to manufacture an item when the company has requested that they be approved for that item. The Source Development Office (CRS) reviews the package submitted to determine if the documentation is complete. After the package is complete, it is submitted for evaluation by the Engineering Division (CRE). An engineering evaluation of the source's capabilities is accomplished within CRE. If source is judged acceptable, the decision is documented on the Form 761 and is forwarded to the appropriate Directorate of Material Management (MM) organization for concurrence in the source approval. Upon MM concurrence, the source is added to the AFLC/AFSC Form 761 as an approved source. The processing may involve visits to the potential source's facility by CR or MM personnel.

Source development actions result from existence of a sole source situation or a situation in which no source is available. The major difference between source development and source approval is the often extensive effort required during source development to identify potential sources. This activity often involves market surveys or comparison of the product requirements with the capabilities of known sources. These market searches attempt to identify sources from whom requests for source approval can be solicited. After receipt of the request, the processing is accomplished in similar fashion to the source approvals.

Current data reported within AFLC does not discriminate between source approval and source development. The estimated resources required to accomplish either source development or source approval are shown in figure 5-4.

Organization	Development	Approval
CRS	40	6
CRE	40	8
D/MM	40	6
	120	20

Figure 5-4 Source Approval Resources Required

Since these activities are generally accomplished totally within the CRS function, it would appear appropriate to establish a control system which would record the resources (personnel and travel) expended in each evaluation. General types of activities such as vendor fairs could then be allocated across the cases to account for the full activity of the CRS function. In those cases where participation by personnel from other ALC organizations is required, the expended resources can be added to the case record by CRS personnel.

Solicitation Sets (z_4) The increase in competitive acquisition requires the preparation of bid sets to be provided to the potential competitors. These bid sets describe the AF requirement and the proposed contracting approach. The major portion of the bid set is the acquisition data package for the part to be acquired. The acquisition data package includes the technical data needed for an otherwise capable manufacturer to build the required part. The acquisition data package may include such items as drawings, specifications, test procedures and schematics.

After the data package has been approved through the screening process described above, sufficient copies of it must be prepared by the Engineering Data Repository at the ALC. Based on interviews accomplished, the average bid set is estimated to cost $10. Depending on the facts of the specific solicitation, 55 to 100 copies of bid set are prepared yielding an estimated cost of $550 to $1000.

Additional Bid Evaluation (z_5) The same situation as is described above exists in the evaluation of the quotations received. When the number of competitive proposals, quotations or bids increases, there is an increased requirement for evaluation and abstracting of the documents. The research indicated that an average of 1/2 hour is required to abstract each competitive buy.

Additional Pre-Award Surveys (z_6) Where a new source is being considered for award, it is necessary that the Principal contracting Officer make an assessment of the responsibility and responsiveness of the offeror. This is often supported through a Pre-Award Survey (PAS). The PAS is accomplished by the Contract Administration Office (CAO) which is responsible for the offeror's facility. The survey may

be done based on the information available at the CAO or it may involve a visit to the contractor facility. The research indicated that an estimated 1/3 of the new sources would require PAS' and the 40% of these PAS would require on-site visits. The average time required to accomplish the PAS was estimated as 2 hours administrative time in PM, 3 hours administrative and office research at the CAO and 6 hours on site (when required).

Technical Assistance (z_7) When a new source is producing an item it may be necessary for the ALC personnel to provide assistance to the source in understanding and meeting the requirements of the acquisition data package. Where these actions are necessary the Contracting Officer or the PMD function should maintain a record of the actions and the resources consumed. These resources should be be tracked by PMD in a fashion that will allow estimating the proportion of new competitive purchases for which technical assistance was required as well as the resources utilized in providing the assistance.

Contract Administration (z_8) As the proportion of items purchased from prime contractors decreases, there is a corresponding need to increase Government field acquisition support. When the prime contractors are purchasing parts for the AF they provide the personnel required for source evaluation, quality assurance, inspection, material review and performance monitoring. When the acquisition activity through the prime decreases the corresponding effort must be assumed by the DOD. Insufficient data was available during the course of this effort to estimate the magnitude of this effort. Much of the impact will fall on the Defense Contract Administration Service (DCAS) since they maintain cognizance over the majority of the facilities which provide material and services to the AF. If these additional personnel are required and not available, there is a risk that the quality of the hardware being received by the AF could be impacted negatively. According to AFR 26-1, Contract Administration can be estimated as 4% of the expected contract price and this figure should be used for estimating purposes.

5.5 Personnel Cost Guidelines

In developing the cost estimates involving personnel, the recommended procedure of AFR 26-1 should be utilized. The GS, GM or WG level for the task should be determined and the effort priced at the step 5 level for GS or GM positions and step 3 for WG positions. To this is added 35.8% (per AFLCP 173-10) for standard fringe benefits. AFLCP 173-10 indicates that an additional 18 % should be added to basic pay rate to compensate for annual sick and holiday leave. In addition, the Phase I research indicates that there should be a 6.1% overhead cost applied reflecting the structure of the Competition Advocate structure.

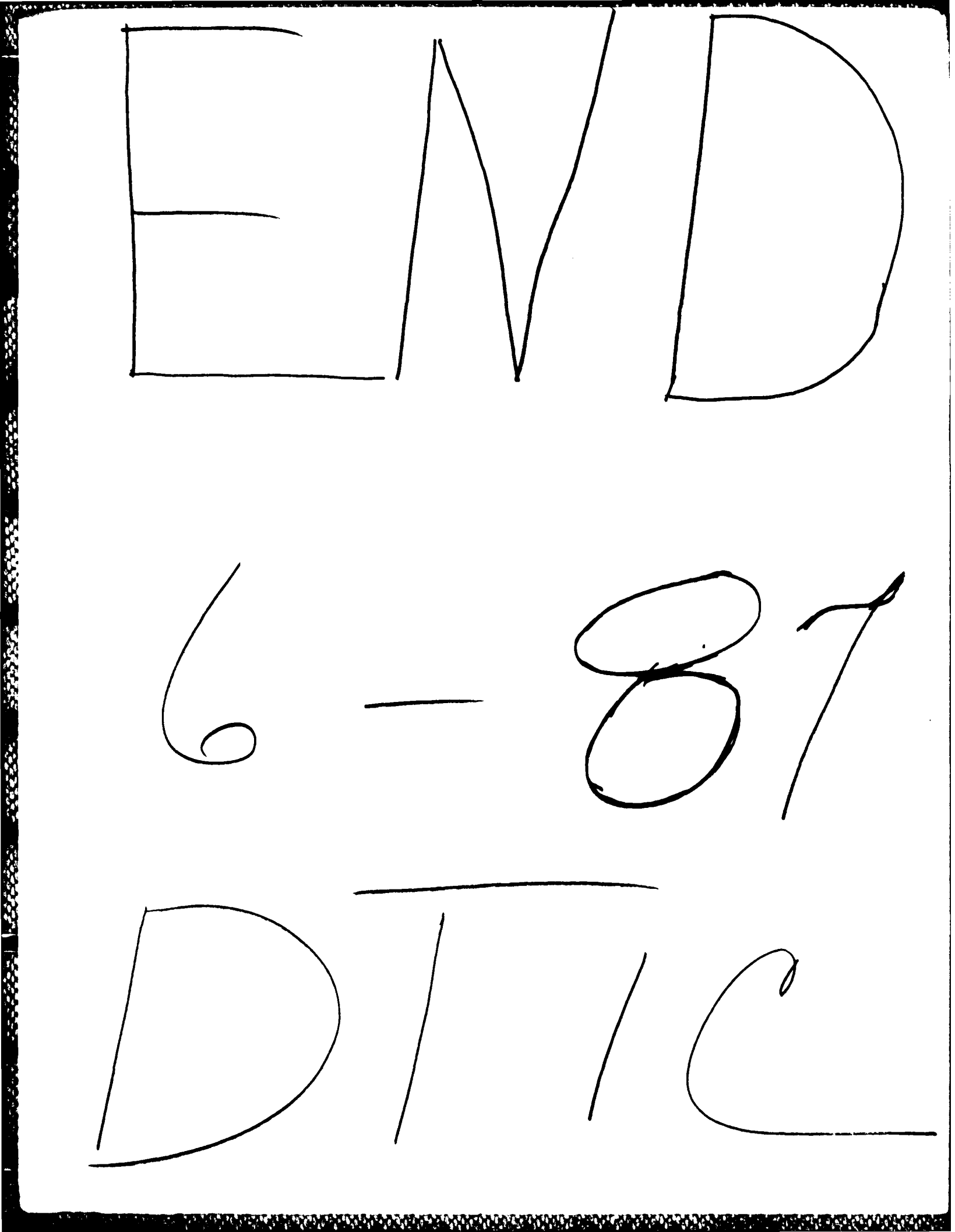
5.6 Other Costs

There are other costs which arise from the breakout program which are much more difficult to quantify accurately. The Phase I report provided under this contract identified a general increase in the number of delinquent deliveries and the proportion of these delinquencies which are long term (greater than 90 days). These delays in delivery can cause the Air Force to take extra-ordinary supply actions to maintain fleet readiness. When parts are not available, readiness is often maintained by inter Command shipments of spare parts, local fabrication, cannibalization and mission reassignment to other available aircraft. In addition to the delays in delivery, Aviation Week and Space Technology in a May 6, 1985 article stated that readiness of the F100 engine was being negatively impacted by "...low quality parts from a dozen or so of the subcontractors who won in competitive bidding." (1) This situation suggests that greater emphasis on the source qualification activity may be necessary to determine the acceptability of proposing source and on the in-plant Procurement Quality Assurance activity being accomplished. At present, there does not appear to be any way to quantify these costs for inclusion within the model.

(1) Marsh, Alton K., "Half of USAF's F100 Engines in Spaces Inventory Unusable", Aviation Week and Space Technology, May 6, 1985.

5.7 Saving Estimate

While significant progress has been made in AFLC's ability to calculate the savings resulting from first time competitive or direct purchase, the ability to estimate at the specific item level needs to be improved. The major source of this estimate should be the historical data in the J041 system. A significant impediment to the use of this data arises from the high error rate alleged by ALC PM personnel to be present in the coding of the Actual Method of Procurement in the J041 system. The Phase I research effort confirmed that there were large numbers of apparent errors in this data field. Improving the accuracy of this information will allow breakout managers to establish relationships between the expected savings and part description. This information can then be used in developing more item specific estimates of the level of expected savings. Until such data is available and can be analyzed, it is recommended that estimated savings of 29% be used for change to direct purchase and 24% for the introduction of competition.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